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PATENT FAMILY

#	Patent No.	Kind	Date	Applic.No.	Date
1)	AU9213066	A	19920924	1992AU-0013066	19920320
2)	CA2063489	A1	19920921	1992CA-2063489	19920319
3)	DE4109091	A1	19920924	1991DE-4109091	19910320
4)	EP-504637	A2	19920923	1992EP-0103333	19920227
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5)	JP05079884	A	19930330	1992JP-0063123	19920319

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Patent Assignee :
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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Device for Detecting a Liquid Surface

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(57) 1 Claim

Abstract

Device for detecting a liquid surface

In the apparatus for detecting a liquid surface a transmitting antenna is connected to an oscillator having an amplifier downstream, receiving antenna has a selective amplifier, a Schmitt trigger and a monostable flip-flop downstream.

BEHRINGWERKE AG HOE 91/B 006 DPh.HS/sch

Description

Device for detecting a liquid surface

In an analysis system, for example a blood analysis system, samples and reagents are taken from stock containers. In order to minimise contamination, it is necessary to ensure that the removal device (cannula) only dips slightly into the liquid to be removed. In addition, it is necessary to detect that liquid is still present.

To detect the liquid surface, the liquids with their containers, the stand for the containers and the removal device are used as part of a capacitor circuit. In this connection, the liquid removal device takes on the function of a transmitting antenna or of an electrode of the capacitor, the liquid that of an electrical conductor, the container that of the dielectric and the base (metal plate) for the container that of the receiving antenna or that of the counterelectrode of the capacitor. A device is known in which the transmitting antenna is connected to an oscillatory circuit which is detuned on dipping into the conductive liquid. A problem is the required working frequency of approximately 600 kHz. A device is furthermore known which comprises a transmitting antenna and a receiving antenna which is connected to ground (short-circuited capacitor). This device is very susceptible to malfunction. Even the contact of the transmitting antenna with the skin of the operator causes a short circuit. In a further known device, the transmitting antenna transmits pulses or pulse trains which are fed by the receiving antenna to an evaluation system (processor) which determines in turn whether a signal is present or not. This device is not adjustable. It responds very sensitively to the position of the receiving antenna and to external effects. It is here that the invention seeks to provide a remedy.

The object is achieved by a device which comprises a transmitting antenna connected to an oscillator and having an amplifier downstream, and also a receiving antenna having a selective amplifier, a Schmitt trigger and a monostable flipflop downstream.

The advantage of the invention is essentially to be seen in the fact that even the approach of the transmitting antenna to the surface, i.e. the lowering of the level of the surface, can be detected. It can be operated with relatively low frequency. Transmitting antenna and receiving antenna can be interchanged. A processor is unnecessary; the indication takes place directly.

The invention is explained in greater detail below with reference to the circuit diagram in Figure 1. An oscillator 1 is used to generate a square-wave voltage of any desired frequency, for example of 10 kHz, which is set with an amplifier 2 to between 0 and 20 volts. The signal originating from the amplifier is fed to a transmitting antenna 6, for example the cannula of the removal device. The immersed transmitting antenna 6 acts as electrode with the conductive liquid, the container 7 as dielectric and the receiving antenna 8 as current electrode of a capacitor. Said capacitor is capable of transmitting the steep edges of the square-wave voltage. The edges received by the receiving antenna 8 are amplified by a selective amplifier 3 and converted into square-wave signals by a Schmitt trigger 4. The square-wave signals are converted by a monostable flipflop circuit 5 into high-low signals and indicated directly using 10. 9 indicates the liquid surface.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. Apparatus for detecting a liquid surface (11) comprising a transmitting antenna (6) connected to an oscillator (1) and having an amplifier (2) downstream, and also a receiving antenna (8) having a selective amplifier (3), a Schmitt trigger (4) and a monostable flip-flop (5) downstream.

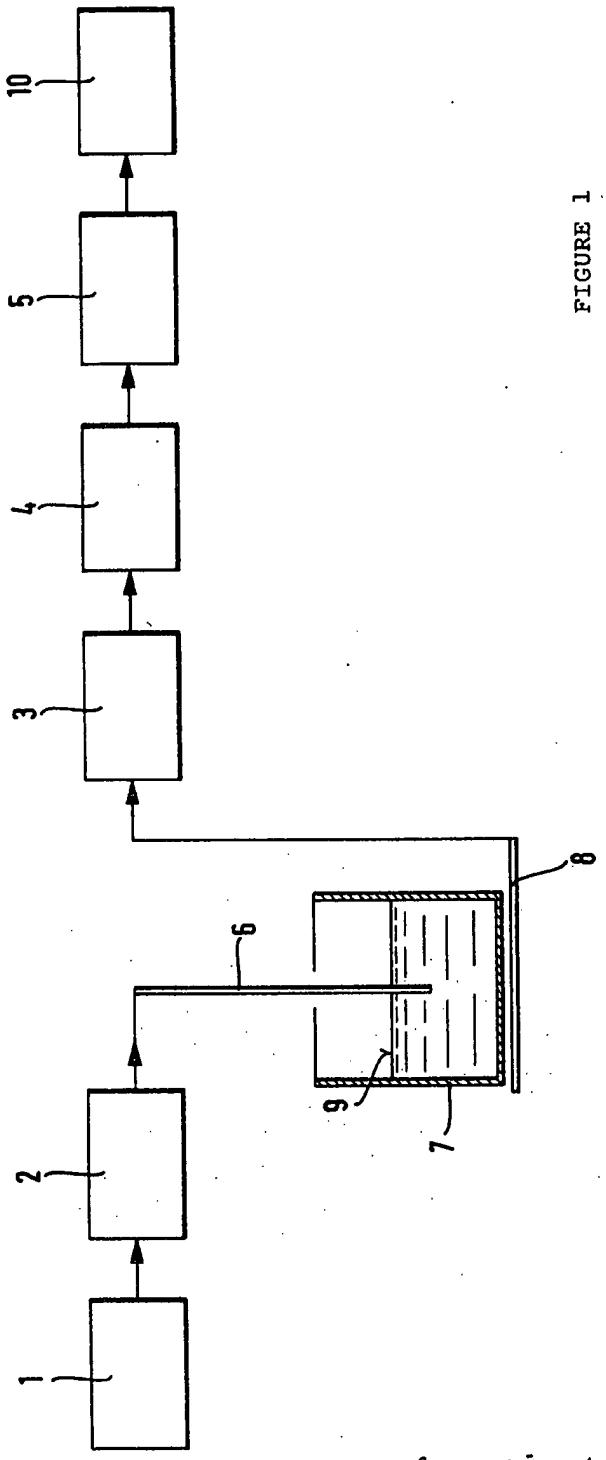

FIGURE 1

By: Beresken & Parr